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F-16 AIRCREW TRAINING DEVELOPMENT PROJECT

Contract No. F02604-79-C8875

DERIVATION, FORMATTING AND USE OF
CRITERION-REFERENCED OBJECTIVES (CROs)
AND CRITERION-REFERENCED TESTS (CRTs)

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DEVELOPMENT REPORT No. 5
MARCH 1981

Prepared in fulfillment of CDRL no. B010
and partial fulfillment of CDRL no. B015

by

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# PREFACE

This report was created for the F-16 Aircrew Training Development Project contract no. F02604-79-C8875 for the Tactical Air Command to comply with the requirements of CDRL nos. B010 & B015. The project entailed the design and development of an instructional system for the F-16 RTU and instructor pilots. During the course of the project, a series of development reports was issued describing processes and products. A list of those reports follows this page. The user is referred to Report No. 34, A Users Guide to the F-16 Training Development Reports, for an overview and explanation of the series, and Report No. 35, F-16 Final Report, for an overview of the Instructional System Development Project.

F-16 AIRCREW TRAINING
DEVELOPMENT PROJECT REPORTS

Copies of these reports may be obtained by writing the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314. All reports were reviewed and updated in March 81.


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# EXECUTIVE SUMMARY

An integral part of the F-16 instructional design process involves the development of criterion-referenced objectives (CROs) and criterion-referenced tests (CRTs). This report defines both CRO and CRT as used in the F-16 project. It also specifies procedures and conventions that were used to write them.

There are several benefits associated with the use of CROs and CRTs. By following the procedures described in this report, a team of minimally trained people can produce a clear definition of the contents of a training program. The problems of not knowing where to start, guesswork, and confusion are eliminated when this systematic approach is used.

CROs represent specific behavioral statements about expected student performance after the completion of instruction. The conditions and standards of acceptable performance are also part of this statement. Specifying instructional outcomes in terms of student performance has a number of advantages:

1. CROs are related directly to actual job performance.

2. CROs provide a focus for the student in the form of a statement describing what he should be able to do.

3. CROs provide a source of feedback to the student by offering him a chance to compare his performance with the required performance, which in turn means that a large part of the instruction becomes self-guided.

The CRTs are a logical extension of the CROs. They measure the attainment of the CROs. Since the CROs consist of actual job performance objectives, the CRTs provide the instructor and the student with a profile of the student's strengths and weaknesses on job performance. CRTs for the measurement of CROs have the following minimal characteristics.

1. A description of the environment and equipment required in the test setting.

2. A description of the problem situation.

3. A set of instructions to the student describing the performance expected.

4. A description of the evaluator of the behavior to be measured or noted.

5. A set of evaluation rules for rating each measurement to determine mastery.

6. A method or form for the evaluator to record the results of the measurements.

7. A rule for combining individual measurements in a task or course into a pass/fail statement.

In summary, CROs and CRTs tell all personnel involved in pilot training just exactly what should be taught, what should be learned, and what level of competence is expected.

CONTENTS

# DERIVATION, FORMATTING AND USE OF CRITERION-REFERENCED OBJECTIVES (CROs) AND CRITERION-REFERENCED TESTS (CRTs)

## 1.0 INTRODUCTION

The writing of criterion-referenced objectives (CROs) will be a step in the instructional development process used for the F-16 Aircrew Training Development Project. The purpose of this paper is to (1) define CRO as a term, and (2) specify the procedure which will be used during the F-16 project to write them. In addition, this paper will define and describe criterion-referenced tests (CRTs) and state the conventions that will be observed in writing them.

The term "criterion-referenced objective" grows out of a sister term, "criterion-referenced test". Glaser (1963)[1] coined the term "criterion-referenced test" to make a distinction between two ways of testing behavior: norm-referenced testing (NRT), a long-established methodology, and CRT, a relatively new idea. The concept of CRT has become almost universal among instructional developers. The distinctive feature of a CRT is that student performances are judged adequate or inadequate by comparison with a set standard, or criterion, rather than by comparison with the norm, or the average of other scores. Behind Glaser's thesis is the idea that there must be a statement of behavior standards against which behavior is to be referenced. In current practice, instructional developers state these behavior standards in written objectives. These have been termed "criterion-referenced objectives," and the use of the term has become common in some development communities. In other development circles other terms are used to refer to the same type of objective, because no standard terminology has been found that is acceptable to everyone. Even though developers do use different terms to express what they are doing, they commonly recognize the necessity of a CRO-type construct in their work.

[1]Glaser, R. Instructional technology and the measurement of learning outcomes: Some questions. <u>American Psychologist</u>, 1963, 18, 519-521.

## 2.0 DEFINITION OF CRO

The variety of names for CROs indicates a problem area in instructional development. Developers do not fully agree upon the definition, use, and method of deriving CROs. This paper defines the term CRO for F-16 project purposes. In the development of F-16 aircrew and instructor pilot training, the term CRO will be used to refer to a performance objective formed by adding conditions and standards to a selected set of behaviors taken from an inventory of job performance. To be included in a CRO, a behavior must be of a particular length and complexity to be able to be evaluated. The purpose of CROs is to state the terminal behaviors students will ultimately achieve at the end of training sequences, those conditions under which these behaviors will be performed for testing purposes, and the standards by which adequate performance will be measured. CROs represent the behavior gates through which students must pass at the end of the instructional path in order to be certified competent in job performance.

CROs relate to each other in a manner which creates an upper-level architecture for the training course. Just as certain instructional objectives prepare a student to accomplish these behaviors, CRO behaviors may themselves be preparatory steps for reaching accomplishment of more complex, lengthy, and sophisticated CRO behaviors. Taken together this architecture of CROs represents a progression from less to more job-like behaviors.

### 2.1 CRO Derivation

The method which will be used to derive F-16 CROs is described below as a sequence of four general steps.

1. Performing a task analysis. The development of CROs begins with an exhaustive inventory of job tasks. Often this task inventory or task analysis is looked upon as a separate instructional development task. It is included as the first step in CRO development to emphasize that the inventory of tasks provides a vital foundation for the CROs--something missing from most CRO lists. For F-16 purposes, the inventory process will be referred to as "task analysis" and the product as "task listing".

The task listing is a layered decomposition of job tasks into component subtasks. At upper levels of the task listing, tasks are inclusive and represent lengthy and complex behaviors. At lower levels, the task listing contains behaviors which are increasingly less complex and less lengthy. Figure 1 is a simple demonstration of the relationships which exist in a complete task listing. Note that there are two types of relations between tasks and their subordinate subtasks: (1) Subtasks may be steps in the task execution (time-sequenced if the task is algorithmic

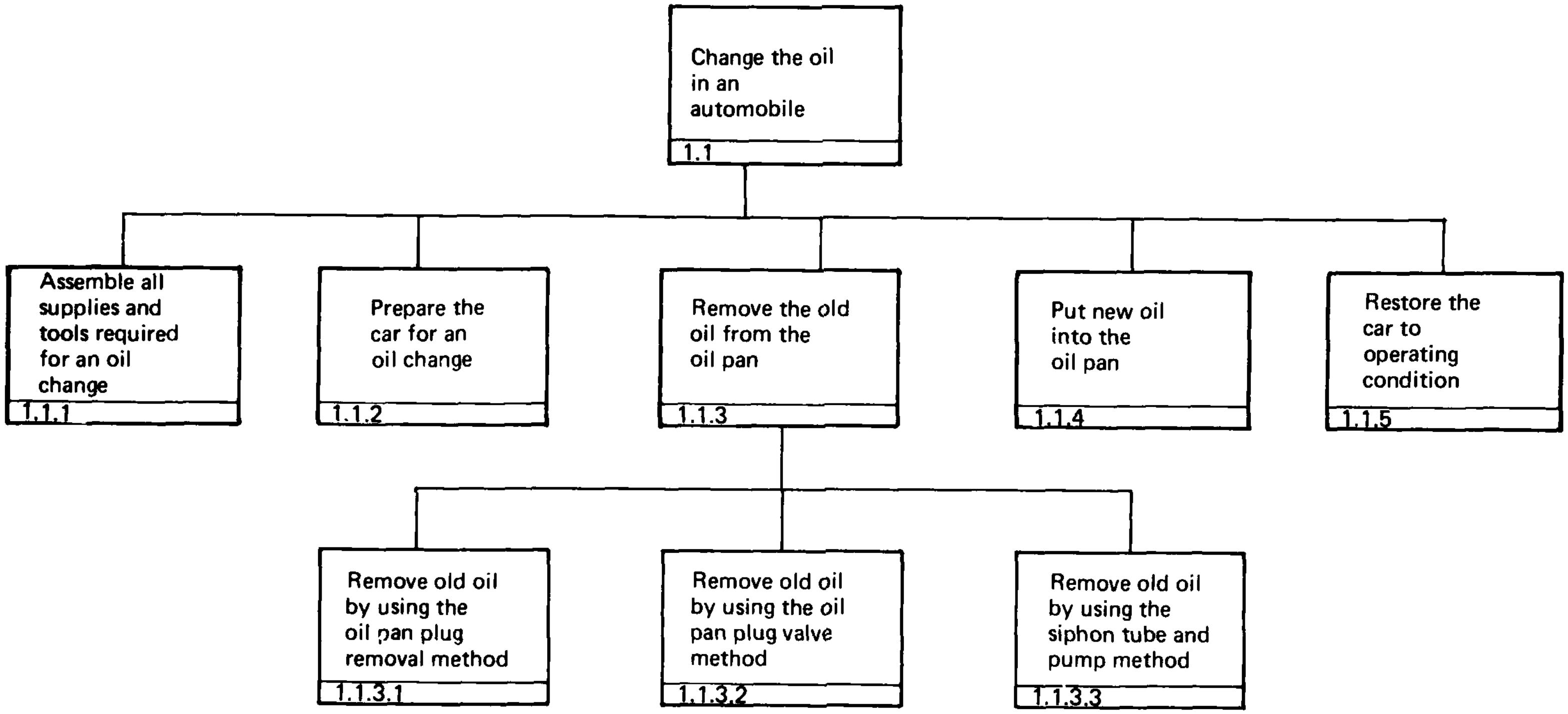


**Figure 1 – A Simplified Task Listing**

or nonsequenced if the task is a heuristic behavior) or (2) subtasks may be different varieties of a task. In Figure 1, a simplified task listing, subtasks 1.1.1 to 1.1.5 are a time-sequenced set of steps for task 1.1. Subtasks 1.1.3.1 to 1.1.3.3 represent three ways in which subtask 1.1.3 may be accomplished. There and several other task analysis conventions which are discussed at greater length in F-16 Development Report No. 4, "Review of Existing F-16 Task Analysis."

2. Determining the extent of the task listing. The decomposition that takes place during the task analysis process can produce a list of tasks at any predetermined level of detail. Extreme levels can be reached, down to the listing of the performer's individual finger and eye movements. The level of detail sought by the task analyst is guided by the purpose of the analysis. In studying and designing job environments an extreme level of detail is desirable to the human-factors engineer, but not useful to the instructional developer writing CROs.

The second necessary step in CRO writing, which will form its basis, is specifying the desired level of detail to obtain a set of tasks with consistent dimensions of length and complexity. The factors bearing on the decision of where to terminate the task breakdown are practical. CROs give rise to CRTs. It is not practical to set up a testing situation for miniscule, short-duration behaviors. The paperwork involved in specifying tests and keeping records would be prohibitive. CROs are written for tasks of a duration and importance to make it practically feasible and desirable for testing to take place. This feasibility and desirability can be expressed in time limits or number of observation points required during measurement.

3. Selecting tasks for CRO use. During analysis for instructional development purposes, when the preselected level of detail has been reached, task decomposition ceases. Then tasks which will serve as CROs are identified. These consist of (1) all bottom-level tasks of the analysis and (2) selected tasks at the upper levels.

Bottom-level tasks are specifically written to be observable and of sufficient length and coherence to represent a complete performance. This is ensured by the decision made in the previous step on when to terminate the analysis. If a termination level of too fine a detail is selected, the CROs resulting will be very short, incomplete behaviors, and the tests of performance will be multiplied in number and fragmented in size. On the other hand, if not enough detail is obtained in the CROs, the behaviors evaluated in performance tests will be too extensive and complex to perform and probably also complex to evaluate.

Selected tasks at the upper levels of the task listing, whose behaviors are more extensive and complex, are also designated as CRO tasks. Because of the structure of the task list-

ing, these higher-level CROs represent a repetition of behaviors of lower-level CROs in interactions of varying length and complexity. The course architecture is a product of the relationship between higher-level and lower-level CROs. It makes possible a progression from the evaluation of isolated behavior performances to evaluation of task complexes and sequences of performance. Behaviors which are selected as upper-level CROs are limited samplings of actual job performance tasks which provide the evaluator with an indication of student progress through the course. Not all upper-level tasks are selected for use in CROs, only those which (1) are possible and desirable to observe and rate and (2) constitute a collection of lower-level tasks representing a significant job-like performance.

4. Converting tasks to CROs. The CRO-designated tasks from the task listing are converted to CROs through the addition of conditions and standards. Conditions state the setting in which evaluation of the behavior will take place: the stimuli impinging upon the senses and sources of information and interference. Standards define the measures which will be used to discriminate adequate from inadequate task performances: measures of time, distance, precision.

The conditions and standards attached to a task define all of the relevant evaluation parameters for that behavior. To recall the CRO-gate metaphor, the conditions and standards define how narrow and difficult the gate will be as the student passes through.

Where possible the job-orientation of conditions and standards will be retained since the performance tests resulting from CROs are most appropriately tests of job behavior. In some cases extremely dangerous behaviors or behaviors which cannot be enacted in real-life situations are encountered. These CROs will be written into CROs with simulator-based or artificial conditions and standards. This will make possible testing of the behaviors in simulated environments which are more practically suited.

## 2.2 Benefits of This Method of CRO Definition

The above procedure for defining CROs is consistent with contemporary instructional development practice and theory. It improves that practice, it is felt, by defining in more detail the procedure for deriving CROs and relating CROs back to early development analysis procedures.

1. A standard method for determining CROs. The method described above is a replicable procedure which can be used by teams of minimally trained persons to obtain a relatively standard product. The set of CROs obtained through this method can been maintained and revised by still other persons using the same

thought processes. Deriving CROs in this way also eliminates much guesswork, confusion, and the problem of not knowing where to start or how to procede, which is sometimes encountered by military and other CRO writers.

2. Usability of thought and logic by subsequent users. The procedure guides the thought processes of the person deriving CROs in a systematic way and ensures that a record is kept of task decomposition decisions and decisions about the relative organization of tasks within the structure of the task listing. Not only are the CROs themselves recorded, but the logical pattern of thought that generated them is recorded as well. This existing framework provides a mechanism to speed and guide the logical process by which the CROs are made.

3. Exhaustive inventory CROs. Deriving CROs through this process is more likely to produce an exhaustive list than deriving them by other means. CROs are embedded in an inventory of all job performance requirements. As the job grows or lessens, the task inventory, and thereby the list of CROs, adjusts accordingly.

4. Building sequence of CROs. This described method (through which the student passes to certified job competency), results not only in a single level of CROs, but in an ordered hierarchy of behaviors as well. Each level upward in the CRO order represents increasingly complex and more job-like performances. This building sequence of CROs not only forms an architecture for upgrading student performance by increments, but, at upper levels, also defines a series of performance tests which can be used for certification and standard evaluation as well.

## 2.3 The CRO Form

To avoid some of the difficulty of providing consistent quality CROs and to simplify the memory component of the task of writing conditions and standards, a form has been devised (a sample of which is presented in Figure 2). This form enumerates several categories of conditions and standards to guide the writer's thinking. The form has the additional purpose of collecting data relevant to each CRO which will later be used in sorting and media selection operations and in the design of instructional sequences. An item-by-item description of the form follows. (For the benefit of CRO authors, an additional job aid was created, which is included as an appendix to this report.)

## 2.4 Condition Classes

The classes of conditions which are listed on the CRO form are intended to help the CRO writer specify all conditions under which a performance is to be evaluated. These are essentially the "givens" of the performance environment, the descriptions of

| AUTHOR | DATE |
|---|---|
| REVIEWER | DATE |

COURSE B____ IP____ C____

TASK NUMBER ____________ REFERENCE TASK ____________

BEHAVIOR:

Conditions: (Avoid Stating Obvious Conditions.)

| | |
|---|---|
| 1. Agency | Info Source For: |
| 2. Manuals and Pubs | Info Source For: |
| 3. Activity | |
| 4. Ext. Environment | |
| 5. Aids | |
| 6. Prod. of Prev. Task | |
| 7. Initiation Cues | Systems Presenting Cues: |
| | |
| | |

Standard (Assume Accurate Measurement)

1. Authority
2. Perf. Precision
3. Comp. Accuracy

DATA:

Steps: ____________

Systems Presenting Cues:

Systems Receiving Manipulations:

Enabling Tasks ____________

| | Life | ACFT | MSN | None |
|---|---|---|---|---|
| Criticality Of Correct Perf. | | | | |
| Difficulty | 4 high | 3 | 2 | 1 low |

| Reference Source | Actual | Recommended |
|---|---|---|

Common Mistakes: Danger ☐ high ☐ low

Figure 2—CRO form.

the external conditions, aids, problem characteristics, and assistance provided to the student as he executes his performance. Each category of conditions is elaborated below.

1. Agency. This condition describes any access which a student is given to an agency or organization from which he is to obtain information. Often, on-the-job performance requires that a student consult an agency (such as operations or weather) in the planning or execution of a mission. The agencies which need to be consulted during task execution are entered under this heading, along with the information items which are obtained from the agency.

2. Manuals and publications. Students are also often required to obtain information from manuals or publications as a part of planning or executing a mission. This condition lists those manuals or publications to which the student has access during task execution. It states the specific information items within the manual which the student may require from the manual.

3. Activity. This condition lists ongoing activities at the time of task performance. Several CRO behaviors are isolated parts of a larger activity. Certain air-to-ground combat tasks, for instance, take place in the context of an ongoing air-to-ground attack. Stating this larger context of ongoing activity defines much of the environment in which evaluation of performance must take place, since that evaluation environment will in many cases seek to approximate actual job conditions.

4. External environment. Under this condition all external environment conditions normally present during the execution of the task are written and must be present during evaluation of that task. External environment may include weather, conditions of threat, light or noise conditions, and other external forces.

5. Aids. Under this condition are listed any aids given to the student not covered in previous conditions. This may include special tools or equipment, prompts given by the evaluator, job performance aids used to assist recall, or manuals and checklists.

6. Product of previous task. Under this condition are stated any products of previous task executions which are available to the student while performing the present task. In sequential tasks, information or decisions from a previous task must very often be given in order for the student to choose actions for the next.

7. Initiation cues. Under this condition are listed specific stimuli to be given to the student as initiation cues for performing the task. For later sorting purposes, we also list the aircraft systems presenting those cues under this condition.

Not included under this list of conditions are conditions of physical or mental stress. It is assumed that the physical stress factors of performance will be kept at a standard level throughout the evaluation of all CROs. It is further assumed that the level of psychological stress present during the evaluation of the given CRO can be adjusted through the manipulation of other conditions which have been stated, for instance, through the manipulation of weather or threat.

## 2.5 Standard Classifications

Standards have also been classified into main categories. Each is briefly described below.

1. Authority. Under this standard are listed any manuals, regulations, standard operating procedures, or other publications or directives which define a set standard to be observed during evaluation. For performance of checklists, for instance, acceptable performance standards are outlined in detail in pilot manuals. Reference is made under this standard to those manuals which contain a description of acceptable performance, and the location of that description within the manual is also entered.

2. Performance precision. Under this standard are listed the parameters which are to be observed during performance of the behaviors and the acceptable range of variation. These standards may include time, distance, relative angle, and standards of rate or rate of change and will not only state the critical key value, but the tolerance limits as well.

3. Computational accuracy. Under this standard are placed the limits of acceptability which are defined by computational accuracy, i.e., the amount of error which can be tolerated in an answer.

## 2.6 Additional Data

The plan for task analysis and CRO development for the F-16 project includes the accumulation of data which can be used in later stages of development for sorting and decision-making purposes. It is important that sorting data be collected so that revisions to the aircraft systems or procedures which will cause revisions to the task can be registered quickly and with full coordination of all documents. It is important that decision-making data also be gathered at time of CRO writing. This will avoid recycling through the task analysis to gather those data at a later date and will consequently avoid the problems attendant to refreshing memories which would come with that process. The data items to be collected for each CRO are described below.

1. Systems presenting cues. Under this data item are listed the names of systems which present cues both during performance of the task and at task completion.

2. Systems receiving manipulations. Here are listed names of systems which are manipulated by the performer during the behavior.

3. Enabling tasks. Under this heading are listed all tasks which are subordinate and prerequisite to performance of the present task.

4. Criticality of correct performance. Incorrect performance or nonperformance of a task may endanger any or all of the following: the mission, the aircraft, or the life of the pilot. Under this heading the danger related to a performance is recorded.

5. Difficulty. The difficulty of the performance is stated here on a 4-point scale. This includes difficulty of psychomotor coordinations and difficulty attendant to heavy cognitive loads or interference.

6. Reference source. Under this heading are listed the exact manual references, including page numbers and paragraphs, dealing with the behaviors. This information will be a key factor in keeping task statements current with changes in doctrinal publications. Two subheadings exist for this data item: Actual indicates the actual document in which the reference is presently found or presently planned to be included. Recommended will include the recommendations of the instructional systems development (ISD) team for placement of the data referenced by the behavior.

7. Common mistakes. Under this data item are recorded common mistakes made by students while learning to perform the task. The level of danger attendant to making each mistake is also recorded.

8. Steps. Under this heading are recorded the actual steps in the execution of the behavior. In later stages of development this will become the core idea for instruction, i.e., the idea around which instruction will center.

## 3.0 DEFINITION OF CRT

A CRT is a test resulting from a CRO. It is convenient to speak of two types of CRTs: (1) CRTs which measure attainment of knowledge or intellectual skill objectives and (2) CRTs which measure attainment of actual job performance objectives (CROs). All of the CRTs resulting from the F-16 CROs will be this second type, since these CROs arise out of an inventory of actual job performances. The focus of this paper is on those CRTs arising out of CROS. All of them will be performance tests of actual job-like behaviors.

CRTs of the performance variety consist of at least the following:

1. A description of the environment and equipment required as parts of the test setting.

2. A description of the particular problem situation (if any) to be presented to the student.

3. A set of instructions to be given to the student on what performance is expected (this may be just a simple instruction to perform a behavior or an entire brief on how and when, as in a mission plan).

4. A description for the evaluator of the behavior to be monitored and a listing of the specific points at which he is to take a measurement or note behavior.

5. A set of rules for the evaluator on rating performance at each measurement or observation point, i.e., a statement for measuring if the student has met the criteria.

6. A mechanism or data form for the evaluator both to record individual observations and to summarize the evaluations.

7. A rule of combining individual measurements into a summary pass/fail statement.

These are the minimum requirements for a CRT of the performance variety. Because the results of CRTs can also be used to diagnose weaknesses in student performance and to prescribe instructional treatments to correct deficiencies, the following CRT characteristics are often added:

8. A diagnostic capability to identify the specific portions of the performance which were deficient.

9. A reference to specific instructional materials and events related to failed portions of the test and which can be used to correct the deficiencies.

There is a high likelihood that these last two items will also occur in the F-16 testing system, although that final decision will be made later.

## 3.1 CRT Writing

CRTs are developed by using all applicable components listed above. Exact procedures for writing and using CRTs will be specified at a later point in the F-16 project. In an evolving weapons system such as the F-16, many aircraft subsystems and procedures for using them will remain unspecified until a later date. This means that important instruction and testing content is unavailable until late in the process and continues to change even after it is obtained. For this purpose, the writing of CRTs is coupled with the writing of instruction. To write CRTs at any earlier stage would not be beneficial to the instructional system and would create a body of work certain to be almost completely revised or replaced.

## 3.2 CRT Administration Procedures

CRTs will be administered in accordance with the conditions statement of the CRO and will be evaluated according to the expressed CRO standard. The exact procedures for carrying out CRTs will be elaborated in training management documents.

Appendix

JOB AID FOR THE
AUTHORING OF CROs

## INTRODUCTION

This job aid for writing and reviewing CROs is prepared to simplify what otherwise might be a difficult task. It is intended for use with the CRO writing procedures and standards expressed in F-16 Aircrew Training Development Project Report No. 5 "Derivation, Formatting, and Use of Criterion-referenced Objectives (CROs) and Criterion-referenced Tests (CRTs)". It is hoped that subject matter experts will be able to use this aid to write CROs of a consistently high quality. The headings that follow refer to the appropriate sections of the CRO form. (See Figure 2.)

## REFERENCE TASK

If the present task is exactly the same as another task elsewhere in the task listing and if a CRO has been written for that task, enter that task name here followed in parentheses by the reference task's higher level activity. (See item 3, "Activity" below.) Then proceed to "Conditions: 3. Activity" and fill in the activity during which the present task will be performed. Leave the rest of the form blank.

EXAMPLE:

Task number: 1.5.1.1.3.5.1

Reference Task: Verify position using DR NAV data (during INS nav)

Behavior: Verify position using dead reckoning navigation

Conditions: 3. Activity: Navigate using ACFT RDR in ground mapping mode

**CONDITIONS** The responses to items 1 through 7 constitute statements of the conditions which will exist as the student executes the task.

1. **Agency**. If the student will be required to contact and/or obtain information from an agency or organization during task execution, enter the agency or organization name here.

| EXAMPLES | NONEXAMPLES |
|---|---|
| Intel | Other ACFT |
| Wx | FAA or TAC as info source for regs |
| Ops | |

Info Source For. Specify the items of information the student is expected to obtain.

| EXAMPLES | NONEXAMPLES |
|---|---|
| Takeoff time | Applicable data |
| Required personal equipment | Appropriate INFO |
| Target position and vector | Regs |
| Safe area location | Procedures |

2. Manuals and Pubs. If the student must be given any manuals or publications for use in and during task execution, list them here.

| EXAMPLES | NONEXAMPLES |
|---|---|
| -1<br>-34<br>FLIP<br>Phase Manual | Pubs, regs, etc. which provide authority for performance of task, but which student does not use during task execution |

Info Source For. List the specific information items the student will be expected to use in the manual or pub.

| EXAMPLES | NONEXAMPLES |
|---|---|
| Drag indexes | Appropriate chart |
| Weather minimums | Required items |
| Engine operating limitations | Required INFO |
| Secure voice procedures | Procedures |

3. Activity. Enter here the main higher-level task which is being executed as the student performs. This will be the main task of which the task he is performing is a part. Most often this will be the next higher task in the task listing.

| EXAMPLES | NONEXAMPLES |
|---|---|
| For task = Turn on secure voice system | |
| Perform fence checks for A-S combat | Secure voice communication |
| For task = Calculate MIL setting | |
| Determine manual delivery data (A-S) | Premission |

4. **Ext. Environment**. List here specific conditions affecting task performance which may be present outside the aircraft as the student performs the task. Consider weather, visibility, light, threat, noise, or other external forces.

| EXAMPLES | NONEXAMPLES |
|---|---|
| Day VMC | ACFT location |
| ECM environment | Season of year |

5. **Aids**. If the student will be given job aids of any kind (other than manuals or pubs), list them here.

| EXAMPLES | NONEXAMPLES |
|---|---|
| Plotters | F-16 ACFT |
| Map | SIM |
| Recon photos | EPT |
| Bingo fuel chart | TACAN |
| | HUD |
| | GCI |
| | AWACS |

6. **Product of Previous Task**. If a condition at the beginning of task execution is the product of a previous task, specify the name of the previous task here, and name the condition.

EXAMPLES

| TASK | CONDITION |
|---|---|
| Prepare Enroute map | Map annotated with alternate airfields |
| Determine egress profile | Number of passes |
| Use radio comm from GCI/AWACS to determine general A-A threat | Threat call |
| Assess fuel situation of other friendly ACFT | Decision to attack |
| Perform radar lock on | Target lock on symbology (diamond) |

NONEXAMPLES

Prerequisite tasks or tasks listed earlier in the task

NONEXAMPLES (cont.)

listing not resulting in product used in present task

7. <u>Initiation Cues</u>. Name the specific cues which tell the student to begin task execution.

| EXAMPLES | NONEXAMPLES |
|---|---|
| Master Caution light illumination | Fence checks |
| Red or Fuel QTY guage | Perceived necessity |
| TGT lock-on symbology on HUD | HUD |
| Clearance from boomer operator | FCNP |
| Directive commentary from GCI | |

<u>Systems Presenting Cues</u>. Name the aircraft systems which deliver the initiation cues to the student.

| EXAMPLES | NONEXAMPLES |
|---|---|
| HUD | GCI |
| FCNP | AWACS |
| REO | Armament switches |
| UHF Radio | Leader |
| | Chart |

**STANDARD** The next three entries define the standard as a statement of how well the task must be executed.

1. <u>Authority</u>.

(a) If the task standard can already be found in a pub, manual, reg, etc., enter the name and exact page and paragraph location here. Also enter the change date of the page.

(b) If a publication or manual states the proper procedure the student must execute and that is to be the performance standard, enter the pub name and the page and paragraph designation. Also enter the change date of the page.

| EXAMPLES | NONEXAMPLES |
|---|---|
| -1 p. 3-7 (Chg 2) | Phase Manual |
| -34 (Chg 1) | Intel reports |
| TACR 55-16 (DTD 1 Jan 71) | Command operating |

| EXAMPLES | NONEXAMPLES |
|---|---|
| 3-1 (DTD 1 Feb 72)<br>AFR 60-15<br>IP judgment (when IP judgment is the <u>only</u> authority for adequacy of performance and when no specific timing, position, accuracy, or standards can be identified.) | procedures |

2. <u>**Performance Precision**</u>. If specific parameters are to be involved in measurement as well as the procedure steps, enter the acceptable range of variation for each parameter. Leave blank if "IP judgment" is entered above.

| EXAMPLES | NONEXAMPLES |
|---|---|
| Maintain +/- 200 FT of altitude<br>+/- 2 NM of desired course<br>+/- .5 AOA<br>Accurately (or 100% accuracy) IAW -1 procedures | Smoothly<br>Accurately<br>Completely<br>Correctly<br>IAW command directives<br>-34<br>FLIP<br>90% accuracy |

3. <u>**Computational Accuracy**</u>. If a computation is involved in task execution, enter here the amount of error which will be tolerated in the answer.

| EXAMPLES | NONEXAMPLES |
|---|---|
| Computed answer +/- XXX | Switches properly configured; required indications on HUD; accurately |

**DATA** Additional data are collected here to be used for sorting and decision-making purposes.

1. <u>**Systems Presenting Cues**</u>. List here the names of systems which present cues both during task performance and at task completion.

2. <u>**Systems Receiving Manipulations**</u>. List here the names of systems which are manipulated by the pilot during performance of the task.

3. **Enabling Tasks**. List here any tasks found elsewhere in the task listing (other than entry level tasks) that contain a skill necessary to the performance of the present task. (This is not necessarily the same as "Product of Previous Task.")

EXAMPLE

Behavior: Identify and respond to main generator failure.

Enabling task: Monitor EPU operation

NONEXAMPLE

Behavior: Perform precautionary landing

Enabling task: Identify and respond to engine malfunction enroute.

4. **Criticality of Correct Performance**. If incorrect performance or nonperformance of a task may endanger the mission, the aircraft, or the life of the pilot, check the appropriate box here. Otherwise check "None".

5. **Difficulty**. Check the box corresponding to the level of task difficulty (4 = high to 1 = low). That is, if the task is complex and the student will require a great deal of practice before the task is performed correctly, check "4". If the task is simple and can be mastered with minimal effort on the student's part, check "1".

6. **Reference Source**.

**Actual.** If a description of or standard for the behavior is presently found or presently planned to be included in a document, enter the name of that document here. If the document exists, specify page numbers, paragraph numbers and the change date.

**Recommended**. List here the name of any documents in which you recommend placement of data relative to the behavior. If there is no change from Actual to Recommended, enter "No change".

7. **Common Mistakes**. List common mistakes made by students while learning to perform the task. Also check the level of danger attendant to making each mistake (high or low).

8. **Steps**. Write out the actual steps in the execution of the behavior. If a document presently exists which clearly lists the steps, you can substitute the document reference, including page and paragraph number and change date.

**NOTE** Every data field on the CRO form must contain an entry.

If the data are unknown at the present time, enter TBD (To Be Determined).

If there are no data to be entered in a field, and there will not be any, write None.

If for a particular task a data field has no meaning or does not apply, enter N/A (for Not Applicable).

**REFERENCES**

When citing AF documents, use only the following designations:

-1
Class -1
-1 checklist
-25
-25 checklist
-34
Class -34
-34 checklist
Tech Order 1-1C-1-30
3-1
AFM 3-16
AFM 51-37
51-50 Vol 8
55-16
TACR 55-200
60-2
AFR 60-15
AFR 60-16
TACR 501-1
FLIP
Phase Manual

## ABBREVIATIONS

To facilitate data searches and sorts, use the following standardized terms. When abbreviations exist, use those instead of writing out the full term. (This list is consistent with TACM 51-50, Chapter 7, and when possible with the F-16-1).

| USE | FOR |
|---|---|
| A/A | Air-to-Air |
| AAA | Anti-Aircraft Artillery |
| AAR | Air-to-Air Refueling |
| AB | Afterburner |
| ACCEL | Acceleration |
| ACFT | Aircraft |
| ACM | Air Combat Maneuvers |
| ACT | Air Combat Tactics |
| ACBT | Air Combat Training |
| ADC | Air Data Converter |
| ADI | Attitude Direction Indicator |
| ADF | Automatic Direction Finder |
| AGL | Above Ground Level |
| AHC | Advanced Handling Characteristics |
| AI | Airborne Interception |
| AIM | Air Intercept Missile |
| AL | Aft Left |
| ALT | Altitude |
| ALT | Alternate |
| ALT CAL | Altitude Calibration |
| AOA | Angle of Attack |
| AOB | Air Order of Battle |
| APPROX | Approximately |
| AR | Armed Reconnaissance |
| ARA | Airborne Radar Approach |
| AC | Area Cover |
| AS | Area Search |
| ARF | Air Reserve Forces |
| ARM | Armament |
| ARI | Aileron Rudder Interconnect |
| ARP | Attack Reference Point |
| ARTCC | Air Route Traffic Control Center |
| A/S | Air-to-Surface (do not use Air-to-Ground) |
| AS | Airspeed |
| AS | Alert Scramble |
| AS | Air Support |
| AST | Air Support Tactics |
| ATA | Actual Time of Arrival |
| ATT | Attitude |
| AUTO | Automatic |
| AWACS | Airborne Warning and Control System |
| AZ | Azimuth |
| BATT | Battery |
| BIT | Built-in-Test |
| BFM | Basic Fighter Maneuvers |

| USE | FOR |
|---|---|
| BVR | Beyond Visual Range |
| $^{o}C$ | Degrees Celsius |
| CADL | Central Air Data Computer |
| CAS | Close Air Support |
| CAS | Calibrated Airspeed |
| CAS | Command Augmentation System |
| CCIP | Continuously Computed Impact Point |
| CCRP | Continuously Computed Release Point |
| C/DU | Control/Display Unit |
| CENC | Convergent Exhaust Nozzle Control |
| CG | Center of Gravity |
| CFT | Composite Force Training; Cockpit Familiarization Trainer |
| CHAN | Channel |
| CIU | Central Interface Unit |
| CIVV | Compressor Inlet Variable Vanes |
| COMM-JAM | Communications Jamming |
| CPT | Cockpit Procedures Trainer |
| CT | Continuation Training |
| CS | Cross Scan |
| DACM | Dissimilar Air Combat Maneuvers |
| DACT | Dissimilar Air Combat Tactics |
| DB | Dive Bomb |
| DCM | Defensive Counter Maneuvering |
| DEG | Degrees |
| DH | Decision Height |
| DISC | Disconnect |
| DISC | Discharge |
| DME | Distance Measurement Equipment |
| DRD | Depressed Reticle Dive |
| DSC | Direct Strike Control |
| DTA | Detonation Transfer Assembly |
| ECA | Electronic Component Assembly |
| ECCM | Electronic Counter-Countermeasures |
| ECM | Electronic Countermeasures |
| ECS | Environmental Control System |
| EEC | Engine Electronic Control |
| EEI | Essential Elements of Information |
| EGTS | Effective GCC Training Sortie |
| EMER | Emergency |
| EMI | Electro-Magnetic Interference |
| ENG | Engine |
| EO | Electro-optical |
| EPU | Emergency Power Unit |
| EW | Electronic Warfare |
| EWO | Electronic Warfare Officer |
| EWR | Electronic Warfare Range |
| EXT | External |
| $^{o}F$ | Degrees Farenheit |
| FAC | Forward Air Controller |
| FC | Fire Control |

| USE | FOR |
|---|---|
| FCC | Fire Control Computer |
| FCMS | Force Capability Management System |
| FCNP | Fire Control/Navigation Panel |
| F/C/P | Front Cockpit (B model) |
| FCR | Fire Control Radar |
| FT | Fixed Target |
| FT | Fleeting Target |
| FFP | Fuel Flow Proportioner |
| FLIGHTREP | Inflight Report |
| FLR | Forward Looking Radar |
| FOB | Forward Oblique |
| FC | Formal Course |
| FID/C | Formation Instrument Departure/Recovery |
| FPM | Feet Per Minute |
| FPS | Feet Per Second |
| FR | Forward Right |
| FSO | Flight Surgeon Officer |
| FSWD | Full Scale Weapons Delivery |
| FT | Feet |
| FTIT | Fan Turbine Inlet Temperature |
| FWD | Forward |
| G | Acceleration of Gravity |
| GCA | Ground Controlled Approach |
| GCC | Graduated Combat Capability |
| GCI | Ground Controlled Intercept |
| GEN | Generator |
| GM | Ground Map |
| GND | Ground |
| GS | Glide Slope |
| GW | Gross Weight |
| HADB | High Altitude Dive Bomb |
| HAP | High Altitude Panoramic |
| HDG SEL | Heading Select |
| HR | Hour |
| HSI | Horizontal Situation Indicator |
| HUD | Heads-up-Display |
| HYD | Hydraulic |
| HZ | Hertz |
| IAW | In Accordance With |
| ID | Identification |
| IEWO | Instructor Electronic Warfare Officer |
| IFF | Identification Friend or Foe |
| IFR | Instrument Flight Rules |
| IFT | In-Flight Target |
| IIRS | Inertial Instrument Reference System |
| ILS | Instrument Landing System |
| IMC | Instrument Meteorological Conditions |
| IMS | Inertial Measurement System |
| INCL | Including |
| INFO | Information |
| INS | Inertial Navigation System |
| INTEL | Intelligence |

| USE | FOR |
|---|---|
| IT | Intercept Training |
| IP | Instructor Pilot |
| I/P | Identification of Position |
| IP | Initial Point |
| IQT | Initial Qualification Training |
| IR | Infrared |
| IR VPP | Infrared Vertical Pinpoint |
| ISC | Indirect Strike Control |
| ISD | Instructional Systems Development |
| IT | Interdiction Tactics |
| IWSO | Instructor Weapons System Officer |
| JETT | Jettison |
| JFS | Jet Fuel Starter |
| Knots CAS | Knots Calibrated Airspeed |
| Knots EAS | Knots Equivalent Airspeed |
| Knots IAS | Knots Indicated Airspeed |
| Knots TAS | Knots True Airspeed |
| KVA | Kilovolt-Ampere |
| LAB | Low Angle Bomb |
| LADD | Low Altitude Drogue Delivery |
| LALD | Low Angle Low Drag |
| LAP | Low Altitude Panoramic |
| LATN | Low Altitude Tactical Navigation |
| LB(S) | *Pound(s)* |
| LCOS | Lead Computing Optical Sight |
| LE | Leading Edge |
| LEF | Leading Edge Flaps |
| LG | Landing Gear |
| LGB | Laser Guided Bomb |
| LOB | Left Oblique |
| LOCS | Line of Communications Search |
| -- | Low Level Navigation Training |
| LORAN | Long Range Navigation |
| M | Mach Number |
| MAL | Malfunction |
| MTA | Manual Terrain Avoidance |
| MAP | Minimum Attack Parameter |
| MAX | Maximum |
| MDA | Minimum Descent Altitude |
| MEA | Minimum Enroute Altitude |
| MFL | Maintenance Fault List |
| MHZ | Megahertz |
| MIC | Microphone |
| MIL | Military |
| MILS | Milliradians |
| MIN | Minute |
| MIN | Minimum |
| MISREP | Mission Report |

| USE | FOR |
|---|---|
| MLG | Main Landing Gear |
| MON | Monitor |
| MQT | Mission Qualification Training |
| MR | Mission Ready |
| MRK BCN | Marker Beacon |
| MS | Mission Support |
| MS | Mutual Support |
| MSL | Missile |
| MSU | Mode Select Unit |
| NAV | Navigation |
| NLG | Nose Landing Gear |
| NM | Nautical Mile(s) |
| NS | Night Sortie |
| NOZ POZ | Nozzle Position |
| NVPP | Night Vertical Pinpoint |
| NWS | Nosewheel Steering |
| OV | Offensive Vector |
| OI | Operating Instructions |
| OPA | Overhead Precautionary Approach |
| OPS | Operations |
| OPT | Optimum |
| OSST | Ocean Ship Surveillance Training |
| PFL | Pilot's Fault List |
| PIO | Pilot Induced Oscillations |
| PQI | Professional Qualification Index |
| PMG | Permanent Magnet Generator |
| PNEU | Pneumatic |
| PS | Pave Spike (AN/ASQ-153 Lower Target Designator) |
| PSA | Pneumatic Sensor Assembly |
| PSI | Pounds per Square Inch |
| PUP | Pop-Up Point |
| PWR | Power |
| PWSO | Pilot Weapons System Officer |
| RST | Radio Silent Training |
| RCP | Radio Control Panel |
| R/C/P | Rear Cockpit (B model) |
| RCR | Runway Condition Reading |
| RCVV | Rear Compressor Variable Vanes |
| RDL | Radar Lay Down |
| RDR | Radar |
| REN | Rendezvous Point |
| REO | Radar/Electro-Optical |
| REOD | Radar/Electro-Optical Display |
| RET SRCH | Return to Search |
| RIE | Radar Intercept Event |
| RIT | Redyced Idle Thrust |
| RIU | Remote Interface Unit |
| RLADD | Radar Low Angle Drogue Delivery |
| ROB | Right Oblique |

| USE | FOR |
|---|---|
| ROR | Release on Range |
| RPM | Revolutions Per Minute |
| RR | Route Reconnaissance |
| RS | Reconnaissance Strip |
| RSP | Radar Scope Photography |
| RSVR | Reservoir |
| R/T | Receiver/Transmitter |
| RWR | Radar Warning Receiver (do not use RHAW) |
| SAR | Search and Rescue |
| SAS | Stability Augmentation System |
| SAT | Surface Attack Tactics |
| SCAR | Strike Control and Reconnaissance |
| SCP | Stores Control Panel |
| SCP | Simulated Combat Profile |
| SEC | Seconds |
| SEFE | Standardization Evaluation Flight Examiner |
| SFO | Simulated Flameout |
| SIF | Selective Identification System |
| SIM | Simulator |
| SL | Sea Level |
| SLAR | Side Looking Airborne Radar |
| SMS | Stores Management System |
| SNVPP | Simulated Night Vertical Pinpoint |
| SOB | Side Oblique |
| STP | Specialized Training Program |
| SPD BRK | Speed Brake |
| SRCP | Simulated Reconnaissance Combat Profiles |
| STA | Station |
| STAN/EVAL | Standardization/Evaluation |
| STBY | Standby |
| SCA | Strike Control Authority |
| STD | Standard |
| TACAN | Tactical Air Navigation System (do not use TCN) |
| TF | Tactical Formations |
| TAO | Terrain Avoidance Override |
| T.D. BOX | HUD Target Designator Box |
| TE | Trailing Edge |
| TEF | Trailing Edge Flaps |
| TEMP | Temperature |
| TEREC | Tactical Electronic Reconnaissance |
| TFO | Terrain Following Override |
| TISEO | Target Identification System Electro-Optical |
| TISL | Target Identification Set Laser |
| TFR | Terrain Following Radar |
| TG | Terminal Guidance |
| T.O. | Takeoff |
| TO | Tech Order |
| TOT | Time Over Target |
| TD | Trail Departure |
| USE | FOR |
| TUOC | Tactical Unit Operation Center |

| | |
|---|---|
| TT | Transient Target |
| UC | Unified Control |
| UCMS | Unit Capability Measurement System |
| UE | Unit Equipped |
| UHF | Ultra High Frequency |
| US | United States |
| VFR | Visual Flight Rules |
| VHF | Very High Frequency |
| VID | Visual Identification Mode |
| VLADD | Visual Low Angle Drogue Delivery |
| VLD | Visual Lay Down |
| VMAX | Maximum Power |
| VMC | Visual Meterological Conditions |
| VPP | Vertical Pinpoint |
| VR | Visual Reconnaissance |
| VTR | Videotape Recorder |
| VTRR | Visual Target Radar Ranging |
| VVI | Vertical Velocity Indicator |
| WORD | Wind-Oriented Rock Deployment |
| WPN REL | Weapons Release |
| WRCS | Weapon(s) Release Computer Set (System) |
| WSO | Weapons System Office |
| WT | Weight |
| WVR | Within Visual Range |
| WW | Wild Weasel |
| WX | Weather |